Using New Sonar Technology as a Fish Monitoring Tool

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Summary

The Tracy Fish Collection Facility (TFCF) salvages fish from the San Joaquin Delta before they enter the Delta-Mendota Canal. At this facility, fish are collected and transported to release sites on the Sacramento River. Monitoring fish activity at key locations of the facilities is important in determining facility effectiveness. Many methods have been used to monitor fish activity including acoustic tagging, hydro-acoustics, and acoustic cameras which have been effective but have their limitations (Miranda and Padilla 2010). New sonar technology has recently become available to Reclamation's Hydraulics Laboratory which may be applicable to monitoring fish activity, especially at remote structures with large volumes of water such as release sites.

This new technology offers additional features unavailable to traditional sonar instruments that are currently in use. This sonar has a range of over 500 ft with an adjustable beam angle (0–180°) giving a wider view of fish activity. It also has the ability to obtain accurate distances, angles, and positions of underwater objects. The instrumentation contains only a few components that are easily portable and quick to set up in the field. The main objective of this research is to determine if this new sonar imaging device is effective as a fish monitoring tool. Results from this study will determine if it is a viable option to monitor and investigate fish activity at release sites in a manner that is fast, simple, and economical as well as provide additional information to what can already be obtained with current methods.

Problem Statement

Each method currently used to monitor fish activity at the TFCF has some limitations. Acoustic tagging provides detailed 3-D tracking of individual fish but can be time intensive and expensive. Sonar instruments such as the DIDSON camera provide high resolution images but are limited by the range and view of activity that can be seen (Miranda and Padilla 2010). Hydro-acoustic instrumentation is also limited in range and

beam angle. Tracking predators in a greater range and monitoring area at release sites may provide additional insight into which factors are most significant in attracting predators.

Goals and Hypotheses

Goal:

1. Determine if data obtained from new sonar technology can be used to complement information from existing fish monitoring.

Hypotheses:

1. The new sonar imaging technology will add to fish monitoring capabilities at release sites by expanding the area or range of observation and providing more detailed information of fish location with time than currently used methods.

2. The location of smaller salvage fish, or groups of fish, can be approximated using available sonar imaging technology. The location of larger individual predator fish and can be tracked using this same technology.

Materials and Methods

A Kongsberg Mesotech MS 1000 (Kongsberg Mesotech, British Columbia, Canada) scanning sonar with the capability of locating and mapping underwater surfaces and objects in high resolution will be used. This instrument has traditionally been used to scan underwater structures and equipment and to guide divers. This particular instrument is currently untested as a fish monitoring tool. To determine if it can effectively monitor fish, initial testing will be done in Technical Service Center's (TSC) hydraulics laboratory in Denver, Colorado. A small number of fish of various sizes will be inserted into a large circular tank in the laboratory. The instrument will be used in the same tank facility to monitor the passing fish and their behavior over a period of time. The purpose of laboratory testing will be to determine at what resolution the various sizes of fish can be monitored and its applicability to conditions encountered at release sites in the field.

Field testing at a demonstration release site will follow using the same instrumentation and techniques as the laboratory testing, only at a greater range. The sonar instrument will be deployed from a dock or small boat and secured to the river bottom with a tripod to monitor fish activity in a specified area near the release pipe discharge. This area will be monitored before, during, and after the fish haul truck arrives for a fish release similar to previous observations reported by Miranda and Padilla (2010). Qualitative results from field tests will help determine if any new or additional information is be provided by this instrumentation. These preliminary results will also indicate to what extent this sonar technology should be used in the future as a fish monitoring tool.

Coordination and Collaboration

The study will be coordinated between the TSC, Mid-Pacific Region and TFCF staffs and the interagency Tracy Technical Advisory Team through regular updates and meetings.

Endangered Species Issues

Permitting may be required to use instrumentation at release sites.

Dissemination of Results (Deliverables and Outcomes)

This study will produce a Tracy Technical Bulletin that summarizes the outcomes from both laboratory and field testing. Laboratory results will include fish size and species monitored and the corresponding resolution capability of the sonar instrumentation for identifying fish. Field test results will include the number and size of fish encountered in the monitoring area for each respective release site and time. These results will be used to evaluate the instrument's capabilities to monitor fish. Comments and recommendations will be made regarding this technology's applicability to fish monitoring and its future use at release sites and other key locations. The technical bulletin will be submitted by September 30, 2012.

Literature Cited

Miranda, J. and R. Padilla. 2010. *Release Site Predation Study*. Sacramento: State of California, Department of Water Resources.